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AMBIENT AIR QUALITY SURVEY IN THE VICINITY OF CANADA WIRE & CABLE LTD. SIMCOE, ONTARIO OCTOBER 1986

ARB-105-87-AQM

NOVEMBER 1987

Ministry of the Environment
Ontario

E. PICHÉ, Director
Air Resources Branch

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PREPARED FOR
WEST CENTRAL REGION
MINISTRY OF THE ENVIRONMENT

BY

R.E. CHAPMAN

AIR QUALITY & METEOROLOGY SECTION
AIR RESOURCES BRANCH
MINISTRY OF THE ENVIRONMENT

NOVEMBER 1987

EXECUTIVE SUMMARY

A mobile air monitoring unit from the Air Resources Branch performed an ambient air quality study in October 1986 in the vicinity of the Canada Wire and Cable plant in Simcoe. There have been complaints from area residents about severe odour problems and resulting loss of enjoyment of property and discomfort.

An odour, identified as phenol by the monitoring crew, was present at each downwind monitoring location; however, phenol and other strongly polar compounds cannot be measured by the gas chromatograph system used for this study.

There were 134 organic compounds monitored. Of the monitored compounds with Ontario standards or guidelines, none of the measured concentrations exceeded those threshold values. The only differences between upwind and downwind results were: slightly higher concentrations of lower molecular weight alkanes at the upwind sites (closer to vehicular emissions and gasoline stations), and slightly higher concentrations of substituted aromatics (compounds of benzene and toluene) at the downwind sites.

SOMMAIRE

Une unité mobile de surveillance de l'air de la Direction des ressources atmosphériques a procédé, en octobre 1986, à une étude de la qualité de l'air ambiant, près de l'usine Câbles Canada située à Simcoe. Les habitants de la région s'étaient plaints de graves problèmes d'odeurs, source de désagrément et obstacle à la jouissance de leur propriété.

Une odeur, correspondant à celle du phénol d'après l'équipe de surveillance, était présente en chaque point de contrôle sous le vent. On ne peut cependant pas mesurer le phénol et les autres composés fortement polaires au moyen du système de chromatographie en phase gazeuse employé dans cette étude.

L'étude a porté sur 134 composés organiques. Selon les normes ou lignes directrices de l'Ontario, aucune concentration des composés étudiés ne dépassait les limites établies. Entre les valeurs au vent et les valeurs sous le vent, on a noté les seules différences suivantes : des concentrations légèrement plus élevées d'alcanes de poids moléculaire plus bas aux points au vent (plus près des émanations des véhicules et des stations-service d'essence) et des concentrations légèrement plus élevées de composés aromatiques de remplacement (composés du benzène et du toluène) aux points sous le vent.

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1.0 Introduction

At the request of the West Central Region, a mobile air monitoring unit (MAMu #2) from the Air Resources Branch made some air quality measurements in late October 1986 in the vicinity of the Canada Wire and Cable Limited plant in Simcoe. This plant manufactures aluminum and copper wire for use in electrical magnet windings. For several years, there have been complaints from area residents about severe odour problems and the resulting discomfort and loss of enjoyment of property.

The purpose of the study was to measure the ambient air concentrations of a large number of organic compounds and determine if any concentrations were large enough to cause odour problems or exceed the Ontario standard for a ½-hour average concentration.

2.0 MAMU #2 and Survey Technique

MAMu #2 contains analyzers for monitoring of carbon monoxide (CO), nitric oxide (NO), nitrogen dioxide (NO_2), methane (CH_4) and non-methane (TH-M) components of total hydrocarbons (THC), ozone (O_3), sulphur dioxide (SO_2), total reduced sulphur compounds (TRS) including hydrogen sulphide (H_2S), elemental mercury (Hg), and some 150 organic compounds using a gas chromatograph.

For this study, the most important analyzer was the gas chromatograph (GC), which was coupled to a volatile organic compounds preconcentrator of our own design. Compounds detectable by the system include alkanes, alkenes, alkynes, aromatics and chlorinated hydrocarbons. Typical detection limits are in the 0.1 - 1.0 ug/m^3 range.

MAMu #2 was also outfitted with meteorological instrumentation to measure wind speed and direction, temperature, relative humidity, barometric pressure and solar radiation.

The analyzers were checked (calibrated) each morning before parking the MAMu #2 in an odorous area downwind of the Canada Wire and Cable plant. Sampling periods for the gas chromatograph were 30 minutes long so that the results could be directly compared to Ministry standards and guidelines. Each downwind monitoring period was usually long enough to collect two GC samples.

3.0 Results and Discussion

Sampling periods, locations and weather conditions are displayed in Table 1.

Each of the nine downwind monitoring periods was accompanied by a characteristic phenol odour; however, phenols and other highly polar compounds such as cresols and acetone are not measurable by the GC system currently used in MAMu #2.

There were 134 organic compounds monitored (Table 2). Average concentrations for those compounds with standards, guidelines or criteria for Ontario ambient air never exceeded those significant levels.

Benzene, toluene and xylene are aromatic compounds that are extensively used in industry and seem to be ubiquitous at fairly low concentrations in the ambient air. During this study, the levels of benzene, toluene and xylene were consistently low with no significant difference between downwind and upwind (background) levels.

Trichloroethene (#54) is a solvent (degreaser) commonly used in the plant to clean aluminum wire. There is a control and reclamation system specifically used for the recovery of trichloroethene; however, it has rarely been used since the usage of the solvent is very low. The trichloroethene levels were always low - less than 20 ug/m^3 - compared to the half-hour Ontario standard (85,000 ug/m^3). Two upwind samples showed slightly higher levels, perhaps due to a nearby dry cleaning operation or other light industry.

The main differences between the upwind results and the downwind results are shown over large ranges of compounds in Table 2. The concentrations of most compounds between butane (#11) and heptane (#57) were larger for the upwind sites, which were closer to gasoline stations and vehicular traffic. This result was expected, since that group of compounds is known to be most prominent near sources of gasoline and vehicle emissions.

The sites downwind of the Canada Wire and Cable plant had relatively higher concentrations of compounds between ethylbenzene (#83) and butylbenzene (#124) than was detected upwind. Since approximately 70% of the wire produced is enamel coated and 75% of the enamel is solvent which is evaporated during the baking process, a slightly higher level of substituted aromatic compounds is expected downwind. As stated previously, however, none of the existing standards or guidelines for Ontario ambient air were exceeded.

It must be stressed that strong odours downwind of the plant were perceived by the monitoring crew. These odours were likely due to phenol and cresols, compounds which the MAMU equipment could not monitor. Further monitoring is necessary to quantify these contaminants.

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TABLE 1

Monitoring Periods in Simcoe

DATE	TIME	LOCATION	COMMENTS
Oct. 28	10:16-12:30	Gilbertson Drive	phenol odour
" 28	13:06-14:25	Bank St. at Second Ave.	upwind
" 28	15:14-17:04	Gilbertson Drive	phenol odour
" 29	10:03-12:05	Gilbertson Drive, north end	phenol odour
" 29	12:12-13:57	Gilbertson Drive	phenol odour
" 29	14:44-15:52	Bank St. at Second Ave.	upwind
" 30	10:22-11:04	parking lot at Canadian Canners Ltd., 0.1 km S. of Can. Wire & Cable	occasional weak phenol odour
" 30	11:28-12:53	Same as previous period	occasional weak phenol odour

Weather Conditions

Oct. 28: Cloudy, 14°-20°C, winds 5-12 km/hr from SW.

Oct. 29: Cloudy, 14°-17°, winds 8-14 km/hr from SW (variable).

Oct. 30: 50% cloud, 9°-14°, winds 5-15 km/hr from N/NE.

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TABLE 2

SIMCOE GC DATA OCT.1986: 30 MINUTE SAMPLES ug/m^3
SAMPLE LOCATION: 1 = GILBERTSON DR. @ CANADA WIRE & CABLE
2 = UPWIND SAMPLE ON BANK ST.
3 = PARKING LOT 100 M. SOUTH OF CANADA WIRE & CABLE

	SAMPLE LOCATION (SEE MAP)	1	1	2	1	1	1	1	1	2	3	3
	SAMPLE START TIME	OCT 28 10:18	OCT 28 11:17	OCT 28 13:09	OCT 28 15:15	OCT 28 16:13	OCT 29 10:05	OCT 29 11:03	OCT 29 12:43	OCT 29 15:05	OCT 30 10:25	OCT 30 11:25
1	ETHANE											
2	PROPANE	22.75	98.91	47.9	24.74	11.38	18.15	15.83	19.43	15.55	11.47	8.57
3	PROPADIENE											
4	PROPYNE				0.8							
5	CHLOROMETHANE											
6	CYCLOPROPANE											
7	2-METHYLPROPANE	12.04	10.54	18.76	8.53	4.8	22.03	7.84	9.39	31.04	28.67	18.76
8	CHLOROETHENE											
9	1-BUTENE	7.49	3.27	5.94			6.61		2.75	15.44	8.98	10.25
10	1,3-BUTADIENE											
11	BUTANE	53.75	35.28	84.28	34.77	14.38	90.91	25.47	35.82	134.66	117.74	79.19
12	1-BUTYNE											
13	CHLOROETHANE											
14	3-METHYL-1-BUTENE	1.81		2.69			2.45		0.85	3.84	2.96	2.18
15	2-METHYLBUTANE	58.4	32.5	92.54	43.71	12.21	80.93	24.31	28.38	127.37	94.17	68.19
16	1-PENTENE	3.18	1.82	4.7	2.43		4.17	1.32	1.41	6.45	4.8	3.54
17	PENTANE	41.34	23.71	65.05	32.78	8.68	55.11	18.7	19.52	87.27	62.76	46.22
18	2-METHYL-1,3-BUTADIENE	2.61	1.55	1.77	1.5		1.35		0.84	1.7	1.87	1.33
19	TRANS-2-PENTENE	5.22	3.02	7.96	4.06	1.34	6.85	2.74	2.17	10.95	7.53	5.78
20	CIS-2-PENTENE	2.96	1.67	4.58	2.34	0.6	3.9	1.3	1.21	6.3	4.38	3.3
21	DICHLOROMETHANE									13.89		
22	2-METHYL-2-BUTENE	8.89	4.37	12.87	6.61	1.67	12.05	3.45	3.54	18.67	12.77	10.07
23	3-CHLOROPROPENE											
24	2,2-DIMETHYLBUTANE	1.83	1.15	2.9	1.72		2.24	0.92	0.89	3.55	2.34	1.81
25	2-CHLORO-2-METHYLPROPANE											
26	TRANS-1,2-DICHLOROETHENE											
27	4-METHYL-1-PENTENE											
28	3-METHYL-1-PENTENE											
29	CYCLOPENTANE	3.41	2.12	5.47	3.6	1.42	5.42	2.57	2.5	7.45	4.9	4.09
30	2,3-DIMETHYLBUTANE	3.97	2.5	6.42	3.61	1.56	4.64	2.43	1.44	7.9	5.12	4.14
31	2-METHYLPENTANE	22.28	14.04	35.36	22.09	6.92	27.01	12.03	9.07	43.66	28.14	22.42
32	3-METHYLPENTANE	14.74	9.49	23.26	14.67	4.48	17.21	7.77	5.52	28.64	18.21	14.52
33	1-HEXENE	1.54		2.3	1.45		1.63			2.78	1.5	1.38
34	cis-1,2-DICHLOROETHENE											
35	2-CHLOROBUTANE											
36	HEXANE	24.4	16.62	35.65	24.11	8.39	27.35	13.9	8.97	42.72	26.76	22.15
37	TRICHLOROMETHANE											
38	TRANS-3-HEXENE	1.2		2.23	1.13		1.33			2.28	1.41	1.47
39	3-CHLORO-2-METHYLPROPENE											
40	METHYLCYCLOPENTANE	10.77	7.3	16.58	11.13	3.85	12.28	6.43	4	20.23	12.86	10.27
41	1,2-DICHLOROETHANE											

TABLE 2

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SAMPLE LOCATION: 1 = GILBERTSON DR. @ CANADA WIRE & CABLE
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42	1,1,1-TRICHLOROETHANE	19.95	43.27	4.14	8		12.72	31.47	26.41		6.86	7.89
43	1-CHLOROBUTANE											
44	BENZENE	24.18	15.71	24.77	23.45	14.74	17.52	13.3	7.62	21.74	15.74	14
45	TETRACHLOROMETHANE			10.81	8.44					11.98		
46	CYCLOHEXANE	3.95	2.91	3.7	2.71	0.92	2.58	1.39	0.88	4.26	2.65	2.25
47	2-METHYLHEXANE	6.15	4.64	9.32	6.79	2.73	6.64	4	2.39	10.97	6.5	5.82
48	2,3-DIMETHYLPENTANE	2.56	1.83	3.24	2.75	1.16	2.52	1.55	0.99	3.63	2.46	2.21
49	CYCLOHEXENE											
50	3-METHYLHEXANE	6.26	4.72	9.13	7	3.03	6.49	4.02	2.51	10.58	6.31	5.63
51	DIBROMOMETHANE											
52	1,2-DICHLOROPROPANE											
53	2,3-DICHLOROPROPENE											
54	TRICHLOROETHENE	10.94	8.32	15.42	11.79	5.19	11.1	7.27	9.36	17.82	10.68	9.50
55	1-HEPTENE	1.88	1.45	2.53	2.01		1.91	1.3	0.84	2.99	1.84	1.64
56	2,2,4-TRIMETHYLPENTANE	2.52	1.73	3.28	2.47	1.61	2.37	1.6	1.22	4.03	2.17	1.7
57	HEPTANE	5.71	6.31	5.8	6.01	3.49	5.43	4.52	4.19	6.29	4.16	3.91
58	1-CHLORO-3-METHYLBUTANE			1.09						1.28		
59	TRANS-2-HEPTENE											
60	METHYLCYCLOHEXANE	5.37	4.31	4.15	4.98	2.84	4.97	3.95	4.21	4.72	3.18	3.36
61	2,5-DIMETHYLHEXANE											
62	4-METHYLCYCLOHEXENE											
63	1-CHLOROPENTANE	2.06	1.59	1.12	2.03		1.91	1.5	1.34	1.24		
64	1,1,2-TRICHLOROETHANE											
65	TOLUENE	29.76	31.02	29.59	39.58	32.51	35.67	33.88	18.27	23.51	26.84	13.46
66	1,3-DICHLOROPROPANE											
67	2-METHYLHEPTANE	3.47	2.85	2.35	3.34	2.55	2.99	2.59	2.87	2.59	1.96	2.23
68	4-METHYLHEPTANE											
69	3-METHYLHEPTANE	3.14	2.83	3.01	3.46	2.17	3.04	2.53	2.33	3.26	1.93	2.01
70	1,2-DIBROMOETHANE											
71	1-OCTENE								0.53			
72	TRANS-4-OCTENE								1.09			
73	2-METHYL-1-HEPTENE											
74	OCTANE	9.31	5.84	3.73	6.56	4.49	7.88	5.65	8.09	2.95	2.62	3.47
75	TRANS12DIMETHYLCYCLOHEXAN	10.21	6.39	4.1	7.19	4.92	8.64	6.2	8.86	3.24	2.88	3.81
76	TETRACHLOROETHENE											
77	2-OCTENE											
78	PROPYLCYCLOPENTANE											
79	CIS12DIMETHYLCYCLOHEXANE											
80	CHLOROBENZENE							1.06				
81	ETHYLCYCLOHEXANE	1.32	1.14		1.09	1.15	1.57	1.53	1.39			
82	1-CHLOROHEXANE											
83	ETHYLBENZENE	21.75	20.98	7.52	17.82	14.46	14.78	11.77	17.71	4.98	5.38	7.52

TABLE 2

B282930
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84	M-XYLENE & P-XYLENE	76.18	70.45	25.05	64.22	51.58	50.51	39.82	60.15	15.83	17.52	25.55
85	P-XYLENE (SEE M-XYLENE)											
86	4-METHYLOCTANE	2.3	2.15	1.77	2.37	1.8	2.04	2.06	1.65	1.53	1.2	1.31
87	2-METHYLOCTANE	2.27	2.12	1.74	2.33	1.77	2.01	2.03	1.62	1.51	1.18	1.29
88	3-METHYLOCTANE								1.9			
89	STYRENE	1.42	1.51	1.1	1.68	1.49	1.47	1.58	0.92		0.93	
90	1,4-DICHLOROBUTANE											
91	1,1,2,2-TETRACHLOROETHANE											
92	O-XYLENE	33.32	29.84	9.5	29.3	21.33	21.61	18.97	28.81	5.86	7.57	11.75
93	1-NONENE							1.34	1.13			
94	1,2,3-TRICHLOROPROPANE											
95	TRANS-1,4-DICL-2-BUTENE											
96	NONANE	7.21	7.67	3.33	6.25	4.83	6.94	8.56	7.69	2.69	2.82	3.38
97	ISOPROPYLBENZENE	6.18	5.3	1.68	7.47	5.44	4.81	4.06	8.43		1.76	2.7
98	2-CHLOROTOLUENE								0.99			
99	3-CHLOROTOLUENE								27.49			
100	PROPYLBENZENE	23.49	19.49	4.12	21.92	14.55	16.67	13.95	86.89	2.43	5.04	8.21
101	4-CHLOROTOLUENE								81.47			
102	3-ETHYLTOLUENE	81.28	64.07	13.95	76.05	50.17	56.34	45.67	85.17	7.53	17.19	28.91
103	4-ETHYLTOLUENE	22.1	19.06	3.65	21.85	15.21	19.63	12.51	24.81	2.77	5.51	8.39
104	1,3,5-TRIMETHYLBENZENE	50.1	37.03	10.21	47.57	30.17	36.42	30.2	49.66	5.7	9.5	17.11
105	2-ETHYLTOLUENE	31.2	24.16	4.88	28.88	19.85	22.21	18.18	30.94	2.54	7.39	11.03
106	1-DECENE								27.27			
107	tert-BUTYLBENZENE &)											
108	1,2,4-TRIMETHYLBENZENE)	114.42	83.78	20.55	103.36	78.65	78.55	62.91	103.14	11.3	27.8	39.8
109	1,5-DICHLOROPENTANE											
110	1,3-DICHLOROBENZENE	2.27	2.01		2.08	2.99	1.48	1.82	2.58			
111	TERTBUTYLCYCLOHEXANE										4.66	
112	(CHLOROMETHYL)BENZENE											
113	DECANE	11.52	15.31	9.73	15.63	15.06	16.44	21.2	10.89	5.7		3.65
114	ISOBUTYLBENZENE											
115	3-(CHLOROMETHYL)HEPTANE											
116	SEC-BUTYLBENZENE								1.11			
117	1,2,3-TRIMETHYLBENZENE	32.29	25.82	10.3	34.99	29.31	28.82	25.51	30.36	6.22	12.81	12.22
118	1ISOPROPYL4METHYLBENZENE											
119	1,2-DICHLOROBENZENE											
120	INDAN	5.29	4.03	3.14	7.2	5.86	6.03	5.98	4.82	1.34	2.85	2.13
121	BUTYLCYCLOHEXANE		1.59		1.28	1.85	1.46	1.81	1.49			
122	1,3-DIETHYLBENZENE											
123	1,4-DIETHYLBENZENE											
124	BUTYLBENZENE	13.1	11.63	7.24	16.57	13.31	14.33	14.54	10.72	3.23	6.61	4.73
125	1,2-DIETHYLBENZENE				2.68	3.78		2.66	1.75			

TABLE 2

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SAMPLE LOCATION: 1 = GILBERTSON DR. @ CANADA WIRE & CABLE
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	SAMPLE LOCATION (SEE MAP)	1	1	2	1	1	1	1	1	2	3	3
	SAMPLE START TIME	OCT 28 10:18	OCT 28 11:17	OCT 28 13:09	OCT 28 15:15	OCT 28 16:13	OCT 29 10:05	OCT 29 11:03	OCT 29 12:43	OCT 29 15:05	OCT 30 10:25	OCT 30 11:25
126	T-DECALIN											
127	UNDECANE	17.32	29.09	22.55	38.59	47.53	44.31	56.45	15.32	12.95	28.44	6.02
128	DECAHYDRONAPHTHALENE											
129	C-DECALIN										3.99	
130	1235-TETRAMETHYLBENZENE	14.31	13.17	11.6	17.34	17.92	16.19	19.14	6.82	8.41		5.73
131	1234-TETRAMETHYLBENZENE		17.5		16.41	19.63		22.09				
132	1234-TETRAHYDRONAPTHALENE											
133	1,4-DIISOPROPYLBENZENE											
134	DODECANE				7.11	10.19	13.18	15.95	3.58		7.8	
	Total Compounds Identified	62	61	61	66	55	64	62	72	58	59	57
	Total # of Peaks	111	105	105	120	97	121	117	129	93	104	82
	Total Area of Peaks	34162.05	27158.31	28511.76	32606.51	20513.70	37006.44	24416.11	55226.30	28898.82	75421.47	20603.59
	Area of Identified Peaks	29305.10	22321.97	24376.68	27548.84	15507.88	31113.53	19417.28	47414.95	25402.24	42399.03	16842.07
	Area % Identified Peaks	85.78	82.19	85.50	84.49	75.60	84.08	79.53	85.86	87.90	56.22	81.74
	Total Hydrocarbons ug/m3	1011.70	916.16	778.68	974.59	638.72	1004.70	729.81	991.01	854.12	725.39	614.45
	Alkanes ug/m3	335.24	331.83	491.10	321.39	175.21	467.86	261.91	205.67	591.04	464.93	328.60
	Cycloalkanes ug/m3	35.03	25.76	34.00	31.98	16.95	36.92	23.88	23.33	39.90	31.13	23.78
	Alkenes ug/m3	36.78	17.15	47.57	21.53	3.61	42.25	11.45	43.63	71.40	48.04	40.94
	Cycloalkenes ug/m3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Alkynes ug/m3	0.00	0.00	0.00	0.80	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Aromatics ug/m3	580.37	494.55	188.85	578.34	439.96	441.56	396.72	578.10	123.39	174.43	213.24
	Chlorinated Alkanes ug/m3	22.01	44.86	17.16	18.47	0.00	14.63	32.97	27.75	28.39	6.86	7.89
	Chlorinated Alkenes ug/m3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Chlorinated Aromatics ug/m3	2.27	2.01	0.00	2.08	2.99	1.48	2.88	112.53	0.00	0.00	0.00
	Benzene:Ethylbenzene	1.11	0.75	3.29	1.32	1.02	1.19	1.13	0.43	4.37	2.93	1.86
	Toluene:Ethylbenzene	1.37	1.48	3.93	2.22	2.25	2.41	2.88	1.03	4.72	4.99	1.79
	Xylenes:Ethylbenzene	5.03	4.78	4.59	5.25	5.04	4.88	4.99	5.02	4.36	4.66	4.96

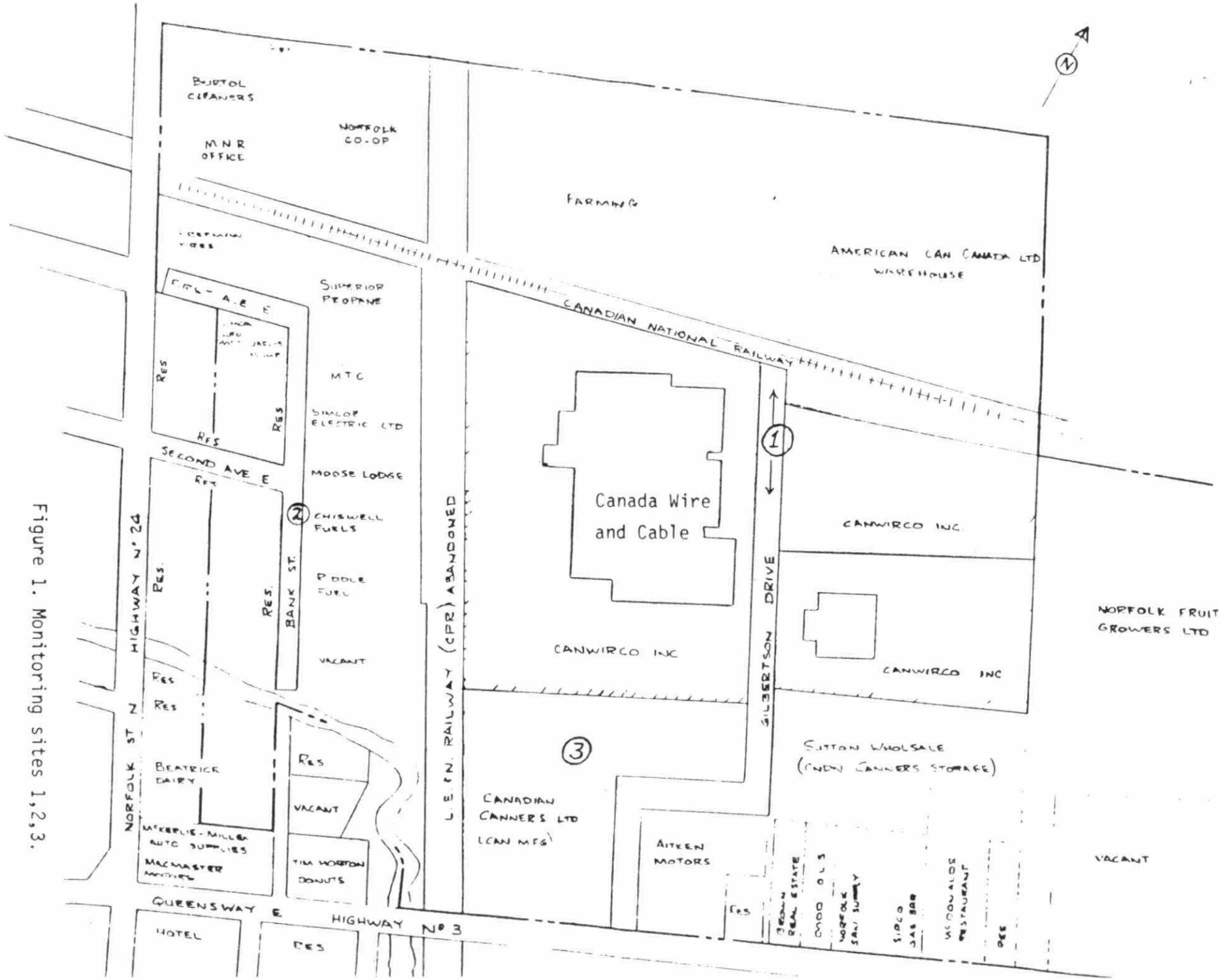

Figure 1. Monitoring sites 1, 2, 3.